**Synthesis of methanol**

#### **1.** How does the industrial preparation of methanol from natural gas differ from the process of fermentation to form ethanol?

#### In your answer, you should include:

#### • a description of the two processes

#### • explanations of any conditions required

#### • balanced symbol equations for any reactions occurring

**2.** In New Zealand methanol is produced from natural gas, methane, extracted from the Taranaki gas fields.

(a) Draw the chemical structures for methane and for methanol.

Write balanced symbol equations for both of the reactions involved in the

production of methanol from methane.

(i) **Reaction 1:** Methane and steam are reacted using a nickel catalyst, Ni, and a strong heat source, to form

carbon monoxide gas and hydrogen gas.

(ii) **Reaction 2:** Carbon monoxide gas and hydrogen gas are reacted at 250oC using a copper-zinc catalyst, Cu-Zn, to form methanol.

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